



## Resolution of Alopecia Universalis After Initiation of Hemodialysis - A Case Report

### Abstract

A 49-year-old male with CKD secondary to chronic interstitial nephritis developed alopecia universalis (AU), characterized by complete loss of scalp, facial, and body hair. Laboratory tests ruled out autoimmune or nutritional causes. The patient began twice-weekly high-flux hemodialysis (HD) without any dermatologic or immunosuppressive treatment. Over the course of 6 months, his uremic symptoms improved, inflammatory markers decreased, and full hair regrowth occurred. This rare case suggests a potential link between uremic immune dysregulation and AU. HD may have contributed to immune rebalancing by clearing proinflammatory toxins and improving nutritional and cytokine status.

**Keywords:** Alopecia universalis, Chronic kidney disease, Hemodialysis, Regrowth of hairs

### Introduction

Alopecia universalis (AU) is the most severe form of alopecia areata, demonstrating complete loss of scalp, facial, and body hair. The pathogenesis of AU is primarily autoimmune, involving T-cell-mediated attack on hair follicles, with cytokines such as IL-15 and IFN- $\gamma$  playing central roles.<sup>1</sup> Prevalence of alopecia in CKD ranges from 20% to 90% and ~10% in patients on dialysis.<sup>2</sup> CKD, particularly in advanced stages, induces systemic immune dysfunction, chronic inflammation, oxidative stress, and malnutrition.<sup>3</sup> Uremic toxins, including middle molecules such as  $\beta$ 2-microglobulin, accumulate, promoting systemic inflammation and altering cytokine profiles. While hair loss is common in CKD due to metabolic derangements and anemia, complete AU resolution with dialysis initiation is rarely reported. This case presents a unique opportunity to explore the role of uremic immune dysregulation in AU pathogenesis and its potential reversal through dialysis.

### Case Report

A 49-year-old male with CKD secondary to chronic interstitial nephritis for 2 years and currently on twice weekly hemodialysis (HD), presented with progressive hair loss over 3 months, culminating in complete loss of scalp hair, eyebrows, eyelashes, and body hair. The patient also had Type 2 diabetes mellitus and hypertension. On clinical examination, a diagnosis of AU was made. Laboratory evaluation revealed normocytic normochromic anemia, hypoalbuminemia, normal thyroid function, negative antinuclear antibodies, and no evidence of nutritional deficiencies (e.g., iron, zinc, biotin). Additionally, the patient didn't receive any medications that can cause hair loss. A comprehensive workup for hair loss showed all values within normal limits. The patient was not administered any iron preparations during this period. The patient initiated twice-weekly HD using a high-flux polysulfone dialyzer. Over 6 months, his uremic symptoms, including fatigue and anorexia, improved. The gradual regrowth of hair over the scalp, eyebrows, eyelashes, and body was observed. Inflammatory marker (c-reactive protein) decreased, and nutritional parameters (serum albumin, Hemoglobin)

improved. The patient didn't receive specific dermatologic treatment, topical agents, or immunosuppressive therapy.

### Discussion

AU is caused by autoimmune-mediated destruction of anagen hair follicles, with a central role played by CD8<sup>+</sup> T-cells and elevated pro-inflammatory cytokines.<sup>1,4</sup> CKD-associated immune dysregulation involves impaired regulatory T-cell function, chronic activation of inflammatory pathways, and accumulation of uremic toxins.<sup>5</sup> These factors may potentiate autoimmune conditions, including AU. HD contributes to immune modulation through clearance of uremic toxins, reduction in middle molecules (e.g.,  $\beta$ 2-microglobulin, advanced glycation end-products), and modulation of inflammatory cytokines.<sup>6</sup> High-flux dialysis enhances the removal of these pro-inflammatory mediators, potentially restoring immune homeostasis. Improved nutrition and reduction in oxidative stress also contribute to favorable conditions for hair follicle recovery. While hair regrowth has been occasionally observed after renal transplantation, complete reversal of AU with HD alone is rare. This case underscores the potential of dialysis in mitigating autoimmune processes exacerbated by uremia.

This case demonstrates complete resolution of AU in a patient with CKD, following HD, suggesting that uremic immune dysregulation may play a role in the pathogenesis of AU. Dialysis may promote hair regrowth by clearing toxins, reducing inflammatory cytokines, and improving nutritional status. Further studies are warranted to investigate the immunologic mechanisms underlying the relationship between CKD, AU, and dialysis.

**Declaration of patient consent:** The authors certify that they have obtained all appropriate patient consent.

**Conflicts of interest:** There are no conflicts of interest.

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